REMARKS

Claims 1 to 26 are pending. No claims are allowed.

1. At the outset, the lead inventor Mr. Robert O'Brien would like to thank Examiners Lenwood Faulcon, Jr. and George Manuel for the time they took to discuss the merits of his application on June 7, 2005, with him and his attorney. The substance of the interview is as set forth in the Interview Summary.

2. Claims 1 to 5 and 10 are rejected under 35 USC 103(a) as being unpatentable over Malonek et al. (U.S. Patent No. 6,292,704) in view of Lieber et al. (U.S. Patent Application Pub. No. 2002/0117659). Malonek et al. teaches mycardial electrodes made from a substrate material, such as platinum-iridium, coated with an inert, high-capacitance material, such as iridium oxide, titanium nitride, pyrolytic carbon, and activated carbon.

Lieber et al. relates to nanosensors comprised of nanowires for detecting the presence or absence of an analyte in a medium. As taught at paragraph 0016, "The nanowire also has a first end in electrical contact with a conductor to form a source electrode and a second end in contact with a conductor to form a drain electrode." (Emphasis added.) In another embodiment, the nanowire comprises an analyte-gated field effect transistor having a pre-determined current-voltage characteristic for use as a chemical or biological sensor. As stated at paragraph 0079, "any nanowire can be used, including carbon nanotubes". This includes single-walled nanotubes (SWNT) formed of a single graphene sheet rolled into a seamless

tube with a diameter on the order of about 0.5 nm to about 5 nm and a length that can exceed about 10 microns. Fig. 1 illustrates a nanoscale detector 10 comprised of a single nanowire 38 positioned above an upper surface 18 of substrate 16. A portion of the nanowire 38 is within the sample exposure region 30. Electrodes 36 connect the nanowire 38 to electrical connections 22 that, in turn, connect to a detector for measuring a change in an electrical or other property of the nanowire.

Independent claim 1 has been amended to set forth that the implantable electrode is intended for direct or active contact with body fluid or to be imbedded in body tissue. Clearly, Lieber at al.'s nanosensor is not. It is a passive device that only contacts a fluid flowing into the sample exposure region through the inlet where a measurement is taken before the fluid flows to an outlet.

Furthermore, the nanotubes of the Applicants' claimed invention each comprise a length between first and second ends. Substantial numbers of them are adhered to the substrate at only their first end. An example is the spiky carbon whisker structures discussed at page 7, lines 9 to 15 and shown in Figs. 2A and 2B. However, as described in the specification at page 3, lines 12 to 30, there can also be nanotubes adhered to the substrate at both their first and second ends. In that case, the first and second ends are of the same polarity.

Regardless whether the presently claimed nanotubes are adhered to the substrate at one of their two ends or at both of them, they do not form a circuit as in Lieber et al. Instead, the present nanotubes are part of a large active circuit consisting of: battery terminal, lead wire, substrate, coating with nanotubes, tissue, counter

electrode, lead wire, and opposite polarity battery terminal. This is the case whether they are adhered to the substrate at one of their ends or at both ends. That way, the nanotubes conduct electrical energy from the electrode substrate directly into body fluid or body tissue while exhibiting relatively low polarization (page 4, lines 3 to 5). In contrast, the Lieber et al. patent describes a sensor where the opposed ends of the nanowire are connected to electrode contacts to complete a circuit for taking a measurement in the sample exposure region. In the presently claimed implantable electrode, the electrical energy dissipates directly into the body fluid or body tissue along the entire length of the nanotube.

Accordingly, amended independent claim 1 is believed to be patentable over this combination of patent references. Claims 2 to 5 and 10 are allowable as hinging from a patentable base claim.

Reconsideration of this rejection is requested.

3. Claims 6, 7, 14 to 19, 25 and 26 are rejected under 35 USC 103(a) as being unpatentable over Malonek et al. in view of Lieber et al. as applied to claims 1 to 5 and 10 above, and further in view of Smalley et al. (U.S. Patent Application Pub. No. 2002/0085968). Smalley et al. describes a method for producing single-walled carbon nanotubes by supplying carbon vapor to the "live end" of a carbon nanotube maintained in an annealing zone. The live end is where the one or more Group VI or VIII transition metals serving as catalysts are located. Then, the carbon nanotubes grow in length by the catalytic addition of carbon from the vapor to the live ends. This is described in paragraph 0067.

At paragraph 0149, Smalley et al. describe the production of a substantially two-dimensional array of single-walled nanotubes (SWNT) aggregating in substantially parallel orientation to form a monolayer extending in directions substantially perpendicular to the orientation of the undivided nanotubes. Fig. 4 illustrates such a molecular array having a plurality of nanotubes 1 bound to substrate 2 by a reactive coating 3 of gold. The SWNT molecules are linked (covalently) to the substrate through a linker moiety such a -S-, $-S-(CH_2)_a-NH-$, $-SiO_3(CH_2)_3NH-$, or the like. The linker moiety may be bound first to the substrate layer or first to the SWNT molecule (at an open or closed end) to provide a reactive sub-assembly. As described at paragraph 0152, arrays containing from 10^3 to 10^{10} and more SWNT molecules in substantially parallel relationship can be used in batteries or as a photoactive molecule to produce a highly efficient photocell.

At paragraph 0160+, methods for growing continuous carbon fibers to a desired length from SWNT molecular arrays are described. The first step is to open the growth end of the SWNTs. Then, a vacuum deposition process adds a transition catalyst selected from Cr, Mo, W, Fe, Co, Ni, Ru, Rb, Pd, Os, Ir and Pt there. This is as a metal cluster, or as a catalyst precursor that converts to a live form under growth conditions. Next, the SWNT molecular array having the catalyst on the open end thereof is subjected to growth conditions. This process is stated to produce tons of SWNT/day (paragraph 0174).

Smalley et al.'s methods are not similar to that set forth in amended independent claim 14. In the presently claimed method, the nanotubes are mixed with one of a host of binder precursors. The mixture is contacted to a

substrate and then converted to adhered nanotubes. As set forth in dependent claims 15 to 19, conversion of the nanotube-containing binder mixture is by heating.

The result is a substrate having a multiplicity of nanotubes adhered thereto. In a similar manner as previously discussed with respect to amended independent claim 1, the nanotubes each have a length between first and second ends. Substantial numbers of them are adhered to the substrate at only their first end. Those nanotubes that are adhered to the substrate at both their first and second ends have the adhered ends of the same polarity. In any event, the entire length of each nanotube provides for moving an electrical charge directly into a body fluid or body tissue for a therapy application.

Separately, amended independent claim 25 sets forth that the substrate is coated with one of a host of catalytic materials before being contacted by a flowing hydrocarbon-containing gas with a plasma assisted chemical vapor deposition process. At paragraph 0072 of Smalley et al., the plasma is generated using a second laser directed at a carbonaceous plasma created by a first laser. As well know by those skilled in the art, a laser generates considerable heat and is by no means a low temperature process. In contrast, the Applicants' plasma assisted chemical vapor deposition process takes place at a relatively low temperature down to ambient.

Nonetheless, the result of amended independent claim 25 is an implanted electrode comprising a substrate having a multiplicity of adhered nanotubes in a similar manner as previously discussed with respect to amended independent claim 14. For that reason, amended independent claims 14 and 25 are believed patentable over this combination of

prior art references. Claims 6, 7, 15 to 19 and 26 are allowable as hinging from patentable base claims.

Reconsideration of this rejection is requested.

4. Claims 8, 9, 11 to 13 and 20 to 24 are rejected under 35 USC 103(a) as being unpatentable over Malonek et al. in view of Lieber et al. as applied to claims 1 to 7, 10, 14, 15, 18, 19, 25 and 26 above, and further in view of Croci et al. (U.S. Patent Application Pub. No. 2004/0151835). Croci et al. relates to coating carbon nanotubes on a substrate for the manufacture of an election-emitting cathode for a luminescent tube. The surface of a substrate is coated with a catalytic substance, for example a salt of iron, nickel or cobalt. If desired, a layer of titanium is deposited on the substrate to enhance catalyst adhesion. Carbon monoxide, acetylene, methane, ethylene, butane, benzene, and mixtures thereof are suitable carbonaceous compounds that can be decomposed to give carbon nanotubes. The growth of nanotubes is then carried out under a gas stream or under a static atmosphere with the substrate heated to about 300°C to about 1,500°C. Passing an electric current through the conductive substrate preferably does the heating. In Fig. 1, the substrate is shown as a wire 5 coated over its entire surface by a layer 6 of carbon nanotubes.

Amended independent claim 20 sets forth the Applicants' method as comprising coating the substrate with a carbonaceous catalytic material. This is discussed at page 5, lines 17ff. Preferably the carbon is in the form of a machined vitreous carbon or is of a carbonaceous coating over a machined metal substrate. Sputtering an amorphous carbon onto the substrate is one preferred

method, as set forth in dependent claim 22. The result is a substrate having a multiplicity of nanotubes adhered thereto, each having a length between first and second ends. Substantial numbers of them are adhered to the substrate at only their first end. Those adhered to the substrate at both their first and second ends have the adhered ends of the same polarity. In either case, an electrical charge is directly moved along the entire length of the nanotube into a body fluid or body tissue for a therapy application. This structure and application is not at all similar to the electron-emitting cathode of Croci et al.'s patent. Therefore, this patent reference does not supply the missing teaching to overcome the deficiencies of the primary and secondary references of Malonek et al. and Lieber et al., respectively.

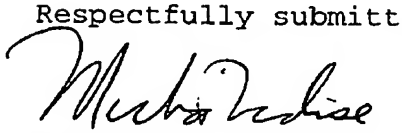
Accordingly, it is believed that amended independent claims 11 and 20 are patentable over this combination of references. Claims 8, 9, 12, 13 and 21 to 24 are allowable as hinging from patentable base claims.

Reconsideration of this rejection is requested.

5. The prior art made of record and not relied upon has been reviewed. However, it is not believed to be more pertinent to the Applicants' presently claimed invention than the above discussed patent references.

It is believed that claims 1 to 26 are now in condition for allowance. Notice of Allowance is requested.

Respectfully submitted,



Michael F. Scalise
Reg. No. 34,920

Greatbatch, Inc.
9645 Wehrle Drive
Clarence, New York 14031
716-759-5810
June 8, 2005